Sustainability of ecology and economic of urban farming development: case study in Makassar City, South Sulawesi Province

by Nurlita Pertiwi

Submission date: 27-Oct-2019 05:45AM (UTC+0700)
Submission ID: 1200920695
File name: abdullah_EEC.pdf (239.3K)
Word count: 3797
Character count: 20831

Eco. Env. & Cons. 23 (1) : 2017; pp. (125-130)
Copyright@ EM International
ISSN 0971–765X

Sustainability of ecology and economic of urban farming development: case study in Makassar City, South Sulawesi Province

Abdullah[1], Gufran Darma Dirawan[2] and Nurlita Pertiwi[2]

[1]Faculty ofAgriculture, University of Muslim Indonesia, Indonesia
[2] Post Graduate Program, Universitas Negeri Makassar, Indonesia

(Received 27 June, 2016; accepted 1 September, 2016)

ABSTRACT

Cities of Makassar, South Sulawesi, experiencing environmental problems as a result of urbanization and physical development of the city. Ecological functions of open space on the wane as a result of increasingly expansive and spread of the region woke up. Urban farming system can be an alternative to improvement the balance of the urban environment and social-economic of urban communities. This study aimed to analyze the level of ecological and economic sustainability as well as to determine the factors sensitive determinant of sustainability of developmenturban farming in the city of Makassar. This research uses MDS method called Rap-Maks-Urfarm to analyze the index and status of urban farming sustainability. Data collected from interview with relevant experts and stakeholders. The results of multidimensional analysis shows that sustainability index value of urban farming is 48.52% which is less sustainable status,but partially the index value of ecologic and economic dimensions respectively 42.66% with a status less sustainable and 50.69% with a fairly sustainable status. The laverage analysis of attributes the ecological dimension shows the sensitive attribute are the condition of irrigation, use of fertilizers and pesticides, organic waste treatment, and the dominant plant species used in urban farming systems. Attributes of the economic dimension was discovered seven attributes sensitive. Analysis of Rap-Maks-Urfarm appropriate and valid (R^2> 0.90 and S < 0.25) to evaluate the level of sustainability of urban farming in the city of Makassar.

Key words : *Urban farming, Sustainable index, MDS (Multi-Dimension Scaling) method*

Introduction

Sustainable city is an important issue of cities in Indonesia, because the development of the city woke up more expansive space utilization of the natural spaces that have ecological functions. This occurs due to the high rate of population growth and urbanization as well as the city's physical development. In Indonesia's Economic Vision 2025 an estimated 65 % of Indonesia's population will live in cities. The phenomenon of the high rate of population growth and urbanization will have an impact on the sustainability of the environmental aspects and socio-economy of a city.

The increase in the urban population without the support and offset the provision of food/nutrition, employment, housing facilities, as well as facilities and infrastructure to support other life would cause problems of social-economic urban, such as urban poverty and food security (Lovell, 2010; Listya Cahya, 2014). Similarly, the use of urban spaces that are not well planned and ignores the ecological func-

Corresponding author's Email : abdullahsituru@ymail.comandgufrandarma@yahoo.com

tions has been causing the increasing environmental problems (Mukaryanti *et al.*, 2006).

One of the important strategies in overcoming problems of the urban environment is the development of urban farming. Urban farming is part of the urban agriculture and can be a beneficial impact on the lives of social-economic and environmental sustainability of the city so that it becomes an integral part of sustainable development (De Zeeuw, 2003; Lovell, 2010; Grover dan Wahee, 2013).Urban farming is a multiple functions: (1) the production of foodstuffs, sustainable solution for food (Specht *et al.*, 2013; De Zeeuw, 2011; Aubry *et al.*, 2010); (2) environmental functions: they can play a leading role in the decarbonization by decreasing CO_2 emissions, reducing the environemet infact of building, reducing transfort emissions, improving the recyclin of resources, reduce waste of the city, the climate balance of the city, and taking pressure off agricultural land, (3) the beauty of the city (forming the landscape of the city), (4) the socio-educational for the public (Aubry *et al.*, 2010; Temple and Moustier, 2004; Specht *et al.*, 2013); and (5) the function of social-economic: improvement of the local economy, food production, job provider (Specht *et al.*, 2010; Cassidy *et al.*, 2008; Pothukuchi, 2004).

In Indonesia, urban farming activity is a form of revitalization of the agricultural sectorto support the development of sustainable cities. Urban farming activities associated with the promotion of lifestyle of returning to nature, promotion of organic farming, beautify the city landscape, environmental education facility for residents of the city, hobbies/pleasure, as well as a livelihood for the urban poor.In addition, the development of urban farming can support the implementation of government programs, eg. Kawasan Rumah Pangan Lestari (KRPL) and Food Oriented Development (FOD). The concept of urban development for the city as a provider of food for its citizens (Adiyoga, 2003; Wija, 2014).

Makassar as a metropolitan city and regional development center in Eastern Indonesia with a population of 1,408,072 people (BPS Makassar, 2014) there are also the problems of population and urbanization as well as environmental imbalances. This indicator can be seen from the increasing urban poor families, the availability insecurity of food and nutrition, reduced urban green open space both quantitatively and qualitatively. Availability of green open space (RTH) of existing town Makassar only 9.2 % and its equivalent to an area of 379.7 ha and has decreased each year (BPS Makassar, 2014).

Makassar city government has tried to dealing with urban environmental and social-economic problems and has been conceived and implemented with varying success achieved, for example, a green city program.implementation of the concept of green cities is carried out in the form of urban farming activities in open spaces, roofs of buildings and public housing yard, and the yard office.

Efforts in the development of urban farming is a complex system involving various components and elements of integrated. Sustainability is strongly influenced by the behavior of the components of the support system. Object of research studies focused on the analysis of the level of sustainability of ecological and economic aspects of the development of urban agriculture. The information from this study can be considered a basis for developing strategies and policies for the development of urban agriculture in the city of Makassar

Research methods

The research was conducted in the city of Makassar, South Sulawesi, with a survey sample consists of five sub-districts of 14 districts. This research conducted in May through September 2015. The data used to describe the sustainability index value of ecological dimension and economic dimensions are the result of interviews with stakeholders and relevant expert.Stakeholders were selected purposively consist of the Government of the City (Departmen of Sanitation and Landscaping, Food Security Agency, Department of Agriculture, the Regional Environmental Agency), community leaders, political figures, the community of users, practitioners of urban farming, plant lovers, farming experts and observers, NGOs, professional organizations agricultural and environmental.

Analytical method use the technique of Multi-Dimensional Scaling (MDS) called Rap-Maks-Urfarm (Rapid Assessment for Urban Farming Makassar). MDS method implemented in a computer program by using Microsoft Office Excel Add-Ins Rapfish. This method is a modification of the approach RAPFISH (Rapid Appraisal for Fisheries) developed by Fisheries Centre, University of British Columbia, Canada (Kavanagh, 2001; Kavanagh and Pitcher, 2004). The output of this analysis is the scale index and sustainability status of each dimension and multidimensional.

The attributs used around 23 attributes, respec-

tively:13 attributes of the ecological dimension and 10 attributes of the economic dimension in assessing the sustainability of urban farming in the city of Makassar. The attributes for each dimension has been assessed by scoring. The range of scores between 0 to 3 were interpreted from bad to good and a score definitive analyzed is the mode value to determine the points positions relative to the sustainability of the good and bad points (Kavanagh, 2001; Sampeliling *et al.*, 2012).

The range of sustainability index and sustainability status grouped four categories: 0 to 25 % bad categories (unsustainable), from 25.01 to 50 % (less sustainable), from 50.01 to 75% (fairly sustainable) and 75.01 to 100% - good categories (highly sustainable). The accuracy of the measurement model (good fit) each dimension and attribute in MDS is reflected through stress value (S) is less than 0.25 ($S < 0.25$) and the coefficient of determination (R^2) approaches a value of 1 or 100 %, which means that selected attributes can account for nearly 100% current conditions (Pitcher and Preikshot, 2001; Kavanagh dan Pitcher, 2004). Furthermore, the Leverage analysis is used to determine the sensitivity attribute to sustainability through changes of Root Mean Square (RMS) in the ordination on the X axis. The greater change of the RMS value of an attribute, the more sensitive or dominant role these attributes to the improvement of the sustainability status. Analysis of the index Monte Carlo used to predict an error rate of analysis in the 95% confidence interval.

Research Result

Multi Dimensional Sustainability

The analysis of MDS Rap-Maks-Urfarm shows that the index value of multi- dimensional sustainability of urban farming in the city of Makassar is 48.52%, where the index value in the range of 25.01 to 50% showing less sustainable status.The dimensions and attributes used in this analysis represents a model with goodness of fit.Analysis of Stress value 0.131(< 0.25) and the value of determination (R^2) was 0.957 (> 90 % or close to 100 %) is quite high. According to Kavanagh (2001) and Ald*et al.*, (2003) means that the model goodness of fit. In addition, the difference in value of the index Monte Carlo (95% confidence level) of the index value of MDSRap-Maks-Urfarm relatively small or not significant (Table 1). The state explained that the simulation using MDS Rap-Maks-Urfarm have a high level of confidence (Kavanagh and Pitcher, 2004).

Ecological Dimensions Sustainability

Analysis of the sustainability of ecological dimension carried out on 13 attributes, namely: the rate of land conversion, land area yard yard, the rate of land use, types of fruit trees dominant cultivated, vegetable crops dominant cultivated, aesthetic value of the environment settings, the value of the ecological function of urban farming, organic waste treatment, the level of use of fertilizers and pesticides, irrigation conditions, conditions of change climate, the potential for flood events, and the area of green open space productive.

Analysis of MDS Rap-Maks-Urfarm shows that the sustainability index value of ecological dimension is 42.66%, and the index value on the range of 25.01 - 50 % showing less sustainable. Furthermore, the leverage analysis of ecological dimension attribute shows the four attributes of sensitive or dominant influence on the value of sustainability index, ie irrigation conditions, the level of use of fertilizers and pesticides, organic waste treatment , and the dominant plant species cultivated (Fig. 1).

Economic Dimension Sustainability

Analysis of the sustainability of the economic dimension carried out on 10 attributes, namely: the need for urban farming inputs, the price of urban farming inputs, provision of incentives urban farming, the productivity of crops cultivated, the contribution of urban farming income to the family economy, the availability of capital for urban farm-

Table 1. Value of index MDS, Monte Carlo, Stress value (S) and the coefficient of determination (R^2)

Dimensions of Sustainability	Sustainability indexes (%)			Value of Sustainability status		
	MDS	Monte	Carlo	Difference	Stress (S)	R^2
Ecology	42,66	40,31	2,35	0,137	0,953	Less sustainable
Economic	50,69	50,47	0,21	0,149	0,947	Enough sustainable
Multidimension	48,52	48,62	0,10	0,131	0,957	Less sustainable

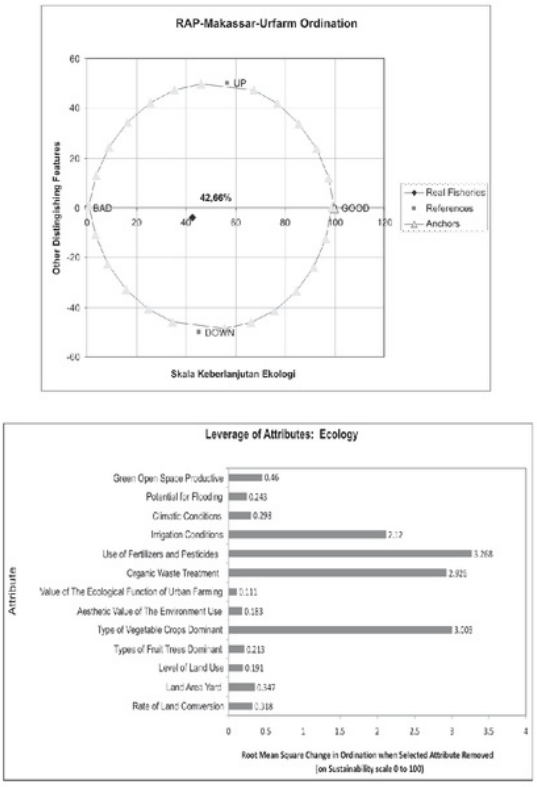

Fig. 1. Analysisof Index and Leverage/Sensitivity of Dimension Ecology Sustainability

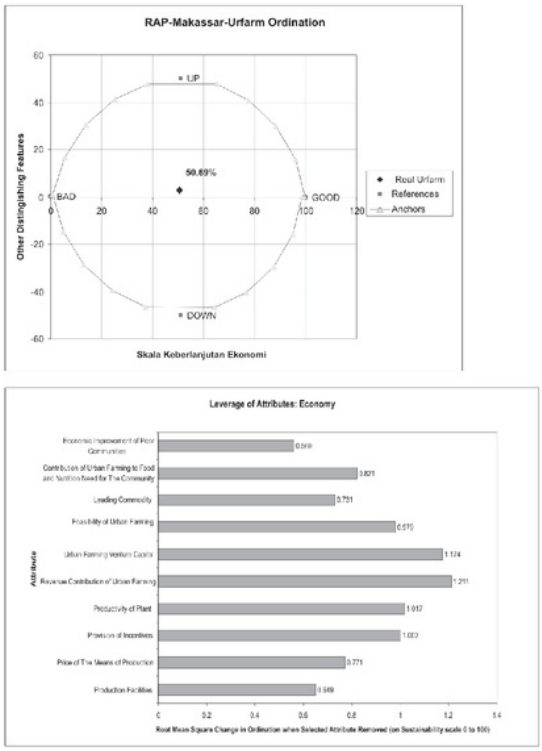

Fig. 2. Analysis of Index and Leverage/Sensitivity of Dimensions Economic Sustainability.

ing, the economic feasibility of urban farming, the type of crops cultivated, the contribution rate of urban farming for food/nutrient of household, and a source of employment/economic improvement of poor communities.

The analysis of MDS Rap-Maks-Urfarm shows that the index value of sustainability of ecolomic dimension is 50.69%, and the index value on the range of 50.01 - 75% showing Sustainable enough. Furthermore, the leverage analysis of economic dimension attribute shows the seven attributes of sensitive or dominant influence on the value of sustainability index, ie the contribution of urban farming income to the family economy, the availability of capital for urban farming, the productivity of crops cultivated, provision of incentives urban farming, the economic feasibility of urban farming, the contribution rate of urban farming for food/nutrient of household the contribution of urban farming to the needs of households and the price of urban farming inputs (Fig. 2).

Discussion

Urban farming can provide ecological and economic advantages for people in urban areas (De Zeeuw, 2003). Urban farming is economically contribute to the production of food/ livestock and food supplies to the town (Aubry *et al.*, 2010). The ecological functions of urban farming can absorb air pollution and contribute to cleaning up the city by using the waste, and as an element of urban landscape (Temple & Moustier 2004; Aubry *et al.*, 2010). The existence of urban farming need to be maintained and improved as it has multifunctional that can support the implementation of the concept of green cities or Eco City (Lovell, 2011).

The results of this study indicate that the development of urban farming as a multidimensional impact less sustainable in Makassar.Urban farming conditions like this still requires improvements to components sensitive attributes that affect sustainability, but improvement interventions can

be done by governments and stakeholders of urban farming. According to Fleury (2005) sustainability of urban farming as a multidimensional approach can use internal and external. Approach internally to conduct a detailed study of the types of urban farming technology that is appropriate for a region. Externally approach is knowing and doing a deal with the government and the public in planning the location of the development of urban farming.

Partiallyanalysis show that ecological dimension impacts is less sustainable, the index value of 42.66 % (Table 1 and Figure 1). Ecological dimension need to get improvement interventions on sensitive attributes in the improvement of sustainability, so that the role of the ecological functions of urban farming can provide profitable and sustainable impact in the future. If there is no improvement efforts, then the existence of urban farming increasingly unsustainable for the environment and ecological balance functions in the city of Makassar.

Urban farming activities has not been applying the principles of environmentally friendly agriculture optimally, for example, management and use of resources of urban organic waste has not been fully implemented. Agricultural technologies developed by the people of the city there is a tendency to be hight external input, so it will be a threat of environmental sustainability. According Specth *et al.*, (2013) in the context of the environment and ecology, the most important issue is how to identify and technically develop the solution of environmental sustainability. The development and adoption of environmentally friendly agricultural technologies become priorities for the government and stakeholders of urban agriculture (Aubry *et al.*, 2010).

However, partially of sustainability index value of economic dimension is 50.69%, it is mean that sustainability status is adequate sustainable (Table 1 and Fig. 2). These results indicate that urban farming can impact economic benefits for the city of Makassar.The same result, urban farming research has been done in other developing countries and has been recommended extensively about the benefits provided urban farming. The local city government has made plans and policies to support the development of urban farming (Lovell, 2010). The development of urban farming with proper management will be able to improve economic growth, improve food quality, build healthy communities (Grover and Wahee, 2013). The economic benefits of urban farming can be: improvement of the lives of urban poor households through improved food consumption and reduce the cost of food for the urban poor (Parrot *et al.*, 2009), diversification of sources of income of the people of the city (Foeken and Owuor, 2008), and the empowerment of women in urban areas (Kumar and Nair, 2004; Madaleno, 2000). The economic potential is achievable because urban farming can be developed, both outdoor and indoor according to environmental conditions, available technologies and crop types appropriate urban areas. The economic role of urban farming in the future will be more strategic because it can provide benefits to urban communities. According to Specht *et al.* (2013) it requires the support of the city government policies in providing facilities and incentives supporting the implementation of urban farming.

Leverage Analysis of the 23 attributes of sustainability shows that there are 11 attributes sensitive, ie four attributes of ecological dimension and 7 attributes of the economic dimension. The sensitive attributes become the dominant factor in influencing the sustainability of the development of urban agriculture in Makassar. According Sampeliling *et al.*, (2012) attributes this sensitive requires attention and better handling, if there is no improvement then the existence of urban agriculture will not be sustainable in the future.

Analysis MDS Rap-Maks Urfarm have a high level of accuracy (goodness of fit) as the estimate value of sustainability index of urban farming in the city of Makassar. This indication is based on the coefficient of determination (R^2) is quite high at over 90 % (from 94.70 to 95.70 %) and the value of Stress (S) is lower than 0.25 (between 0.131 to 0.149). Furthermore, the difference between the value of the index Monte Carlo with an index value of MDS Rap-Maks-Urfarm is less than 5%, i.e. 3.37%. This indicates that the simulation method MDS Rap-Maks-Urfarm have a high confidence level and can be used to evaluate the sustainability index of urban farming development in the city of Makassar.

Conclusions

The development of urban farming in the city of Makassar have less sustainable status with the index 48.52% multidimensional. Partially of economic dimensions have enough sustainable status with 50.69% index, while the ecological dimension have less sustainable status with the index 42.66%.

Of the 23 attributes of sustainability dimensions

analyzed there were 11 attributes need to be taken care immediately because of the sensitive affects on the increase of index and sustainability status of urban farming in the city of Makassar.

The analysis of MDS Rap–Maks-Urfarm appropriate and valid with a high confidence level to assess the sustainability index of ecological and economic dimension of urban farming in the city of Makassar.

Acknowledgement

Thanks to Ditlitabmas and The Director General of Higher Education Ministry of Research, Technology and Higher Education, Republic of Indonesia on funding of research for scheme "Hibah Doktor" Grant Fiscal Year 2016.

References

Adiyoga, W. 2003. Prospek pengembangan pertanian urban (perkotaan). Makalah disampaikan pada Diseminasi Prospek Pengembangan Sayuran di Perkotaan, Balai PenelitianTanaman Sayuran, Lembang, Bandung - 40391, 11-13 Agustus 2003.

Aubry, C., Awa Ba, M.H. Dabat and Ramamonjisoa, J. 2010. Urban agriculture and sustainable urban landscape. An applied research on two case studi (Madagascar and Senegal). 9th European IFSA Symposium, 4 – 7 July 2010, Vienna(Austria). p: 2013 – 2026.

BPS Kota Makassar. 2014. Makassar Dalam Angka 2014.

Cassidy, A. and Patterson, B. 2008. *A Planner's Guide to the Urban Food System*. Post Carbon Institute: Portland, OR, USA, Available online: *http://postcarboncities.net/files/PlannersGuidetothe Food System.pdf* (accessed on 25 July 2011).

De Zeeuw, Henk. 2003. Community Development. p. 212 – 243. In Annotated Bibliography on Urban and Periurban Agriculture. ETCNetherlands Urban Agriculture Programme.

De Zeeuw, H. 2011. Cities, climate change and urban agriculture. *Urban Agriculture Magazine* 25 : 39–42.

Elliott, J.A. 2006. An Introduction to Sustainable Development. 3rded. Routledge. Taylor & Francis Group. London.

Foeken, D.W.J. and Owuor, S.O. 2008. Farming as a livelihood source for the urban poor of Nakuru, Kenya. *Geoforum*. 39 : 1978–1990.

Grover, H. and Wahee, S. 2013. Sustainability Through Urban Farming: A Case Study on Priyanka Amar Shah - Woman Ecopreneur. *International Journal of Retailing & Rural Business Perspectives © Pezzottaite Journals*. Volume 2, Number 3, July –September 2013:600 – 603.

Kavanagh, P. 2001. Rapid Appraisal of Fisheries(Rapfish) Project. Rapfish Software Description (for Microsoft Exel). University of British Colombia.

Kavanagh, P. and Pitcher, T. 2004. Implementing Microsoft Excell Software for Rapfish: A Technique for The Rapid Appraisal of Fisheries Status. University of British Colombia. Fisheries Centre Research Report. Canada.

Kementerian Koordinator Bidang Perekonomian. 2005. Revitalisasi Pertanian, Perikanan dan Kehutanan. Jakarta.

Kumar, B.M. and Nair, P.K.R. 2004. The enigma of tropical homegardens. *Agroforest. Sys.* 61 : 135–152.

Listya Cahya, D. 2014. Kajian Peran Pertanian Perkotaan dalam Pembangunan Perkotaan Berkelanjutan (Studi Kasus: Pertanian Tanaman Obat Keluarga di KelurahanSlipi, Jakarta Barat). J. Forum Ilmiah, Volume 11 Nomor 3, September 2014.

Lovell, S. T. 2010. Multifunction Urban Agriculture for Sustainable Land Use Planning in the US. Sustainability 2010, 2, 2499-2522; doi:10.3390/su2082499. p: 2500 – 2522.

Madaleno, I. 2000. Urban agriculture in Belem, Brazil. *Cities* 17 : 73–77.

Mukarianti, A. M. Zain dan N. Suwedi. 2006. Keberlanjutan fungsi ekologis sebagai basis penataan ruang kota berkelanjutan. J. Tek.Ling. P3TL-BPPT. 7(1) : 7–15.

Parrot, L., Sotamenou, J., Kamgnia, B.D., Nantchouang, A. 2009. Determinants of domestic waste input use in urban agriculture lowland systems in Africa: The case of Yaounde in Cameroon. *Habitat Int.* 33 : 357–364.

Pitcher, T.J. and Preikshot, D.B. 2001. Rapfish: A Rapid Appraisal Technique to Evaluate the Sustainability Status of Fisheries. *Fisheries Research*. 49 (3) : 255-270.

Pothukuchi, K. 2004. Community food assessment—A first step in planning for community food security. *J. Plan. Educ. Res.* 23 : 356–377.

Sampeliling, S., Santun R.P. Sitorus, Siti Nurisyah, dan Bambang Pramudya. 2012. Sustainability Urban Agriculture Development Policy: A Case Study in Jakarta. *Jurnal Analisis Kebijakan*. 10(3): September 2012 : 257–267.

Specht,K., R. Siebert, I. Hartmann, U. B. Freisinger,M. Sawicka, A. Werner, S Thomaier, D. Henckel, H. Walk, A. Dierich. 2014. Urban agriculture of the future: an overview of sustainabilityaspects of food production in and on buildings. Agric Hum Values (2014) 31:33–51DOI 10.1007/s10460-013-9448-4.

Temple, L. and Moustier, P. 2004. Les fonctions et contraintes de l'agriculture périurbaine de quelques villesafricaines (Yaoundé, Cotonou, Dakar). *Cahiers Agricultures*. 13 : 15-22.

Wija. 2014. Urban Farming Belum Jawab Ketahanan Pangan. Institut Teknologi Bandung (ITB) News, Minggu, 9 Maret 2014, 20:49:27.

Sustainability of ecology and economic of urban farming development: case study in Makassar City, South Sulawesi Province

ORIGINALITY REPORT

8%	4%	5%	4%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	iiste.org Internet Source	1%
2	ejurnal.esaunggul.ac.id Internet Source	1%
3	www.thaiscience.info Internet Source	1%
4	C. Aubry, J. Ramamonjisoa, M.-H. Dabat, J. Rakotoarisoa, J. Rakotondraibe, L. Rabeharisoa. "Urban agriculture and land use in cities: An approach with the multi-functionality and sustainability concepts in the case of Antananarivo (Madagascar)", Land Use Policy, 2012 Publication	1%
5	Submitted to Universitas Negeri Padang Student Paper	1%
6	Submitted to Universitas Terbuka Student Paper	1%

7	www.aensiweb.net Internet Source	1%
8	Submitted to Chulalongkorn University Student Paper	1%
9	www.macrothink.org Internet Source	<1%
10	Hubert de Bon, Laurent Parrot, Paule Moustier. "Chapter 38 Sustainable Urban Agriculture in Developing Countries: A Review", Springer Science and Business Media LLC, 2009 Publication	<1%
11	Marzuki, Muhammad, I Wayan Nurjaya, Ari Purbayanto, Sugeng Budiharso, and Eddi Supriyono. "Sustainabiliy Analysis of Mariculture Management In Saleh Bay of Sumbawa District", Environmental Management and Sustainable Development, 2014. Publication	<1%
12	Muhammad Marzuki, Sunarpi Sunarpi, Amiruddin Amir, Muhammad Ridwan. "Analysis of the Potential for Sustainable Development Based Food Products to Support Tourism Fisheries and Economic Community in the Province of Bali", Environmental Management and Sustainable Development, 2017 Publication	<1%

13	Submitted to Universitas Diponegoro Student Paper	<1%
14	Nur Afiani Ratnaningtyas, Widodo Farid Ma'ruf, Tri Winarni Agustini, Johannes Hutabarat, Sutrisno Anggoro. "Prospect and Adversity the Downstream of "Softbone Milkfish" in Semarang City, Indonesia", Aquatic Procedia, 2016 Publication	<1%

Exclude quotes	On	Exclude matches	< 10 words
Exclude bibliography	On		